

XD series

Proportional, industrial hand grip controllers •
non-contacting Hall effect technology



DISTINCTIVE FEATURES

- SIL 2 compatible - Redundant Hall sensors
- Resists high axial load (1780 N - 400 lbf)
- Shallow mounting depth of <60 mm (2.36)
- Rated for 10 million lifecycles
- SAE CAN bus J1939-71



ENVIRONMENTAL SPECIFICATIONS

- Operating Temperature: -40 °C to +85 °C (-40 °F to +185 °F)
- Storage Temperature: -40 °C to +85 °C (-40 °F to +185 °F)
- Above Panel Sealing: Up to IP67 (subject to handle configuration)
- Humidity: IEC 60068-2-38
- Thermal shock: SAE J1455 section 4.1.3.2
- Salt spray: IEC 60068-2-11
- Random vibration: IEC 60068-2-64
- Sinusoidal vibration: IEC 60068-2-6
- EMC Emissions:
 - Radiated Emissions Level: ECE/324/Add.9:2012; CISPR 25:2002
 - Radiated Emissions Level: CISPR 25:2008
- EMC Immunity:
 - ESD: ISC 10605:2008; criteria A
 - Radiated immunity: ISO 11452-2:2004; criteria B
 - Bulk current injection immunity: ISO 11452-4:201; criteria A
 - Pulse 1, Pulse 2a, Pulse 2b, Pulse 3a, Pulse 3b, Pulse 4, Pulse 5a: ISO 7637-2:2011; criteria A



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ELECTRICAL SPECIFICATIONS

- Technology: Redundant Hall effect sensor
- Supply voltage range: 7 - 35 VDC
- Typical current consumption: 12 V @ 53 mA
- Transient overvoltage max: 40 V
- Reverse polarity Max: -1000 VDC
- Output signal: SAE CANbus J1939-71
- Connections: Deutsch DTM04-6p



ELECTRICAL CONNECTIONS

- Six position connector: Deutsch DTM04-6P
- Wire: 22 AWG, PTFE insulation with expandable sleeve
- Length: 6:00" +/- 0.5" (bottom of joystick to connector)



MECHANICAL SPECIFICATIONS

- Operation: Two axis
- Deflection angle in X & Y directions:
 - $\pm 20^\circ$ for square limiter plate (standard)
 - $\pm 16^\circ$ for round limiter plate
- Operating torque, breakout: 1.28Nm*
- Operating torque, 50% travel: 1.93Nm*
- Operating torque, 100% travel: 3.21Nm*
- Maximum axial load: 400 lbf.
- Expected life: 10 million lifecycles (X and Y axis)
- Lever Action (centering): Spring return



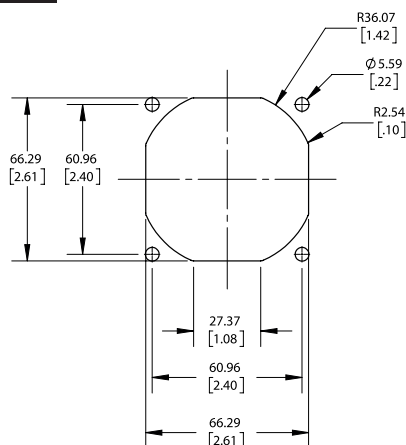
MATERIALS

- Shaft: Stainless steel
- Boot: Silicone
- Handles: Glass filled nylon
- Bezel: Hard black anodized aluminum
- Body: Aluminum
- Cover: Zinc plated steel
- Weight: 800 g

*Considering most common options selected:
 - Option M (1.24Nm)
 - Option G (with guided feel)



PANEL CUT-OUT



CAN J1939 INTERFACE SPECIFICATION

The XD Series utilizes redundant Hall effect sensors to measure the primary X and Y axis. The CAN controller support various button configurations as well as proportional thumbwheels and mini-joysticks for additional axis data.

All axis and button data are delivered on a CAN 2.0B compliant physical interface. Two additional signals allow configuration of the controller Source Address. Controller messages are delivered per the SAE J1939-71 message protocol.

CAN 2.0B INTERFACE PARAMETERS

- Baud rate: 250 Kbps
- Transmission repetition rate: 50 ms to 80 ms **
- BJMI/EJMI interval time: 20 ms
- Terminating resistor: No
(available by special request to factory)
- Connection to Deutsch DTM04-6P connector:

Pin	Color	Function
1	White	CAN Lo
2	Green	CAN Hi
3	Blue	Source Address SEL 1
4	Orange	Source Address SEL 0
5	Black	Ground
6	Red	7 - 35 VDC

** Transmission repetition rate is dependent upon the faceplate configuration.



CAN J1939 INTERFACE SPECIFICATION (CONTINUED)

CAN MESSAGE PROTOCOL

- Primary Axis and button data on Basic Joystick Message 1 (BJM1):
 - Priority: 3
 - Base PGN: 0xFDD6
 - Source address: 0x10¹
 - Data field: 8 bytes
- Redundant Axis data on Extended Joystick Message 1 (EJM1):
 - Priority: 3
 - Base PGN: 0xFDD7
 - Source address: 0x10¹
 - Data field: 8 bytes
- Additional thumbwheels and mini-joysticks data on Extended Joystick Message 2 (EJM2):
 - Priority: 3
 - Base PGN: 0xFDD9
 - Source address: 0x10¹
 - Data field: 8 bytes

Note 1: Alternate source addresses can be configured by grounding of the blue and/or orange wires.

- Source address= 0x10: ORANGE= floating, BLUE= floating (default)
- Source address= 0x20: ORANGE= floating, BLUE= grounded
- Source address= 0x30: ORANGE= grounded, BLUE= floating
- Source address= 0x40: ORANGE= grounded, BLUE= grounded

BJM1 DATA FIELD STRUCTURE:

START POSITION (BYTE/BIT)	LENGTH (BITS)	FUNCTION
1/1	2	Primary X-axis neutral position status
1/3	2	Primary X-axis left position status
1/5	2	Primary X-axis right position status
1/7 to 2/8	10	Primary X-axis position data
3/1	2	Primary Y-axis neutral position status
3/3	2	Primary Y-axis down position status
3/5	2	Primary Y-axis up position status
3/7 to 4/8	10	Primary Y-axis position data
6/1	2	Button 4 status
6/3	2	Button 3 status
6/5	2	Button 2 status
6/7	2	Button 1 status
7/1	2	Button 8 status
7/3	2	Button 7 status
7/5	2	Button 6 status
7/7	2	Button 5 status
8/5	2	Button 10 status
8/7	2	Button 9 status

Note: If faceplate configured with n buttons, Trigger and/or paddle would be respectively positioned in Button n+1 and Button n+2.

EJM1 DATA FIELD STRUCTURE:

START POSITION (BYTE/BIT)	LENGTH (BITS)	FUNCTION
1/1	2	Redundant X-axis neutral position status
1/3	2	Redundant X-axis left position status
1/5	2	Redundant X-axis right position status
1/7 to 2/8	10	Redundant X-axis position data
3/1	2	Redundant Y-axis neutral position status
3/3	2	Redundant Y-axis down position status
3/5	2	Redundant Y-axis up position status
3/7 to 4/8	10	Redundant Y-axis position data

EJM2 DATA FIELD STRUCTURE:

START POSITION (BYTE/BIT)	LENGTH (BITS)	FUNCTION
1/1	2	A-axis neutral position status
1/3	2	A-axis left position status
1/5	2	A-axis right position status
1/7 to 2/8	10	A-axis position data
3/1	2	B-axis neutral position status
3/3	2	B-axis left position status
3/5	2	B-axis right position status
3/7 to 4/8	10	B-axis position data
5/1	2	C-axis neutral position status
5/3	2	C-axis left position status
5/5	2	C-axis right position status
5/7 to 6/8	10	C-axis position data



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CANOPEN INTERFACE SPECIFICATION

CANOPEN INTERFACE PARAMETERS

- Baud rate: 250 kbits/s
- Node ID: 20h
- Buttons: 1A0h (180h + Node ID)
- Analog (axis) outputs: 2A0h (280h + Node ID)
- Heartbeat (500ms): 720h (700h + Node ID)
- Axis resolution: 8-bit
- Network Management: Auto start enabled

BUTTON OUTPUT CONFIGURATION

Button status is transmitted in the 8-byte data field of frames with an identifier of 1A0 (default).

IDENTIFIER	BYTE 0	BYTE 1	BYTE 2	BYTE 3	BYTE 4	BYTE 5	BYTE 6	BYTE 7
1A0	Buttons (7:0)	Buttons (15:8)	-	-	-	-	-	-

ANALOG OUTPUT CONFIGURATION

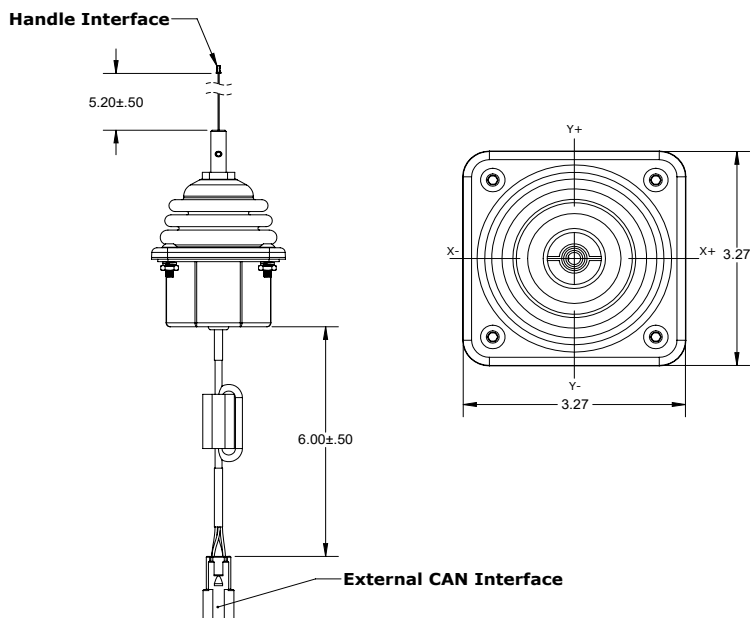
8-bit analog data is transmitted in the 8-byte data field of frames with an identifier of 2A0 (default).

IDENTIFIER	BYTE 0	BYTE 1	BYTE 2	BYTE 3	BYTE 4	BYTE 5	BYTE 6	BYTE 7
2A0	A_IN0(7:0)	A_IN1(7:0)	A_IN2(7:0)	A_IN3(7:0)	A_IN4(7:0)	A_IN5(7:0)	-	-



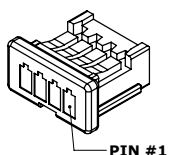
ELECTRICAL INTERFACE AND CONNECTIONS

DIMENSIONS



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HANDLE INTERFACE



SERIAL LINK MOLEX
5013300400 CONNECTOR PIN#
DESIGNATION

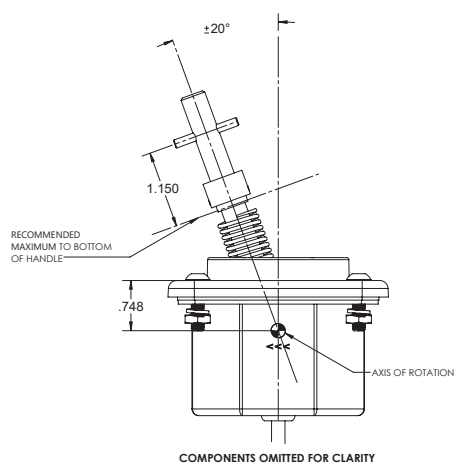
IF UART interface:
19200 baud, no parity, 8
bit, 1 stop bit, no hardware
flow control

PIN #	FUNCTION
1	Vcc (+5 V)
2	Rx
3	Tx
4	Ground

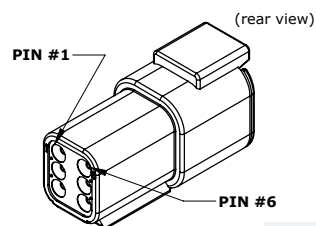
IF CAN interface:

PIN #	FUNCTION
1	Vcc (+5 V)
2	Rx
3	Tx
4	Ground

MECHANICAL INTERFACE AND DIMENSIONS

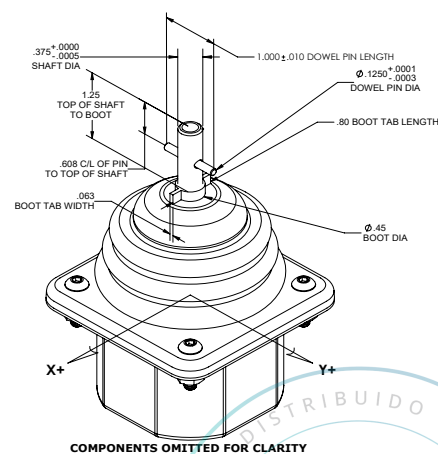


EXTERNAL CAN



DEUTSCH DTM04-6P
CONNECTOR PIN#
DESIGNATION

PIN #	FUNCTION
1	CAN-LO
2	CAN-HI
3	SEL 1
4	SEL 2
5	Ground
6	Vin



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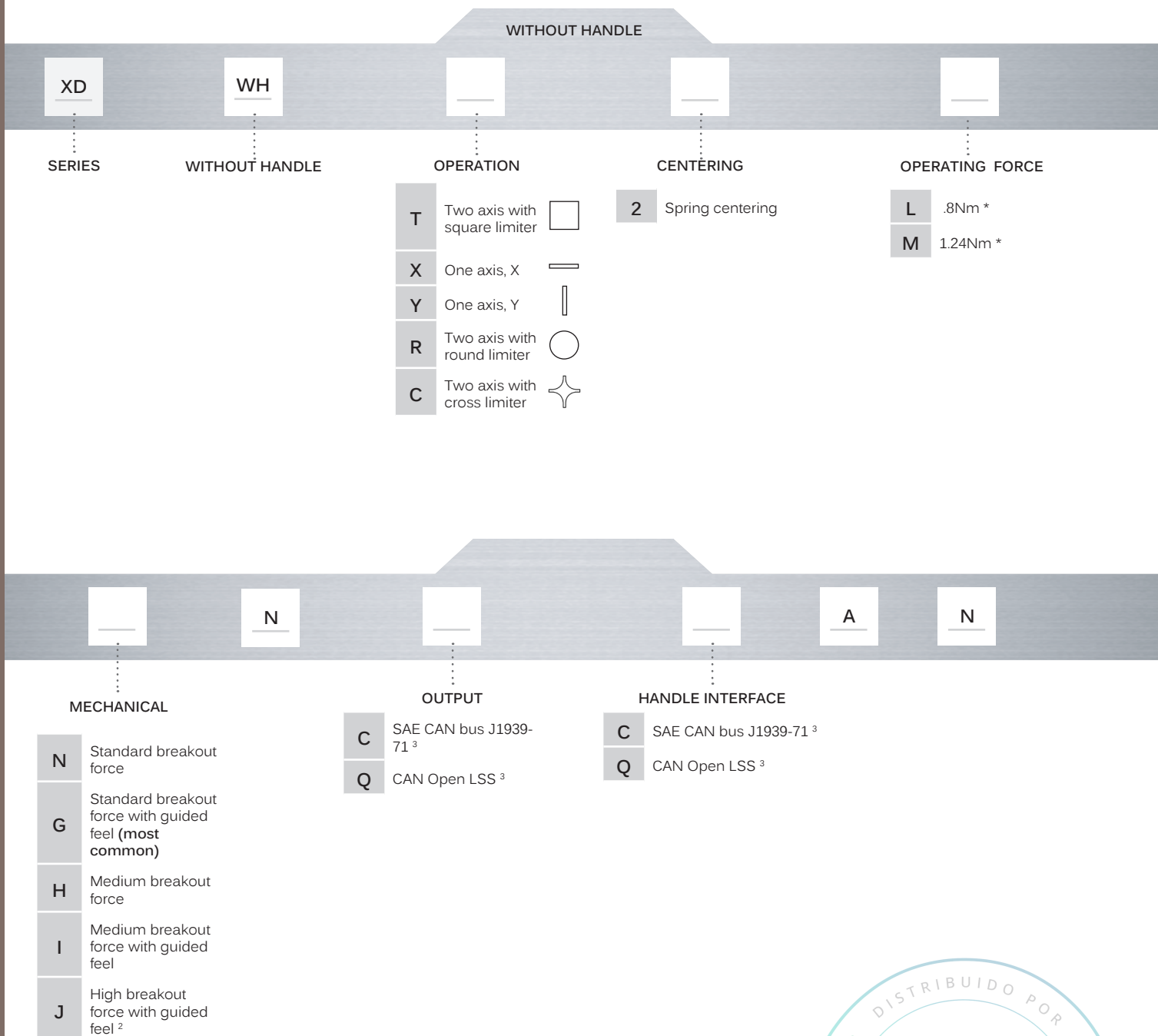
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BUILD YOUR PART NUMBER



Notes:

The Guided feel option aids the joystick lever into the cardinal direction
Guided feel option is recommended for «Operating force Option M»

¹ Measured at $\pm 10^\circ$ (50% travel) from center (without guided feel.)

² High breakout force can only come with round limiter plate.

³ Option selected for HANDLE INTERFACE must be the same as OUTPUT option.



APEM

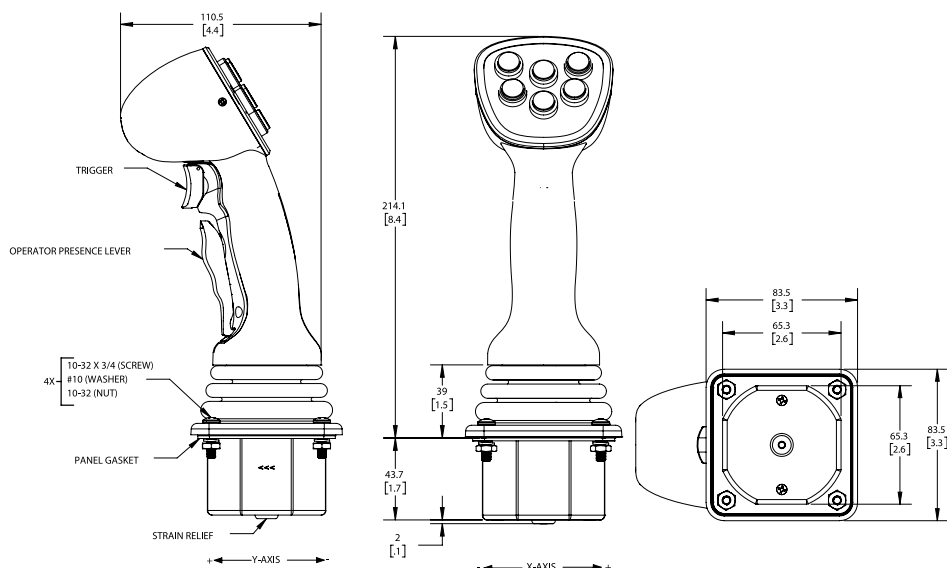


³This configuration cannot be IP67

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DIMENSIONS



COMPONENT DESCRIPTIONS



- **MT series:** Sealed toggle switch
- MOM-OFF-MOM



- **IM series:** Sealed momentary pushbutton
- Snap action
- Red



- **TS series :** Miniature Hall effect joystick
- Two axis, proportional output
- Castle actuator



- **HR series:** Hall effect thumbwheel
- One axis, proportional output
- Black wheel



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FACEPLATE OPTIONS



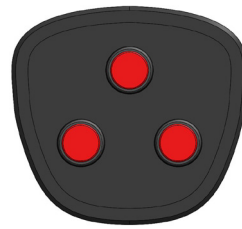
A



B



C



D



E



F



G



H



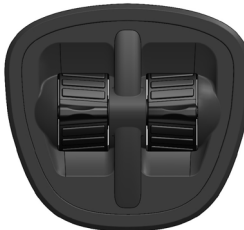
J



K



L



M



N

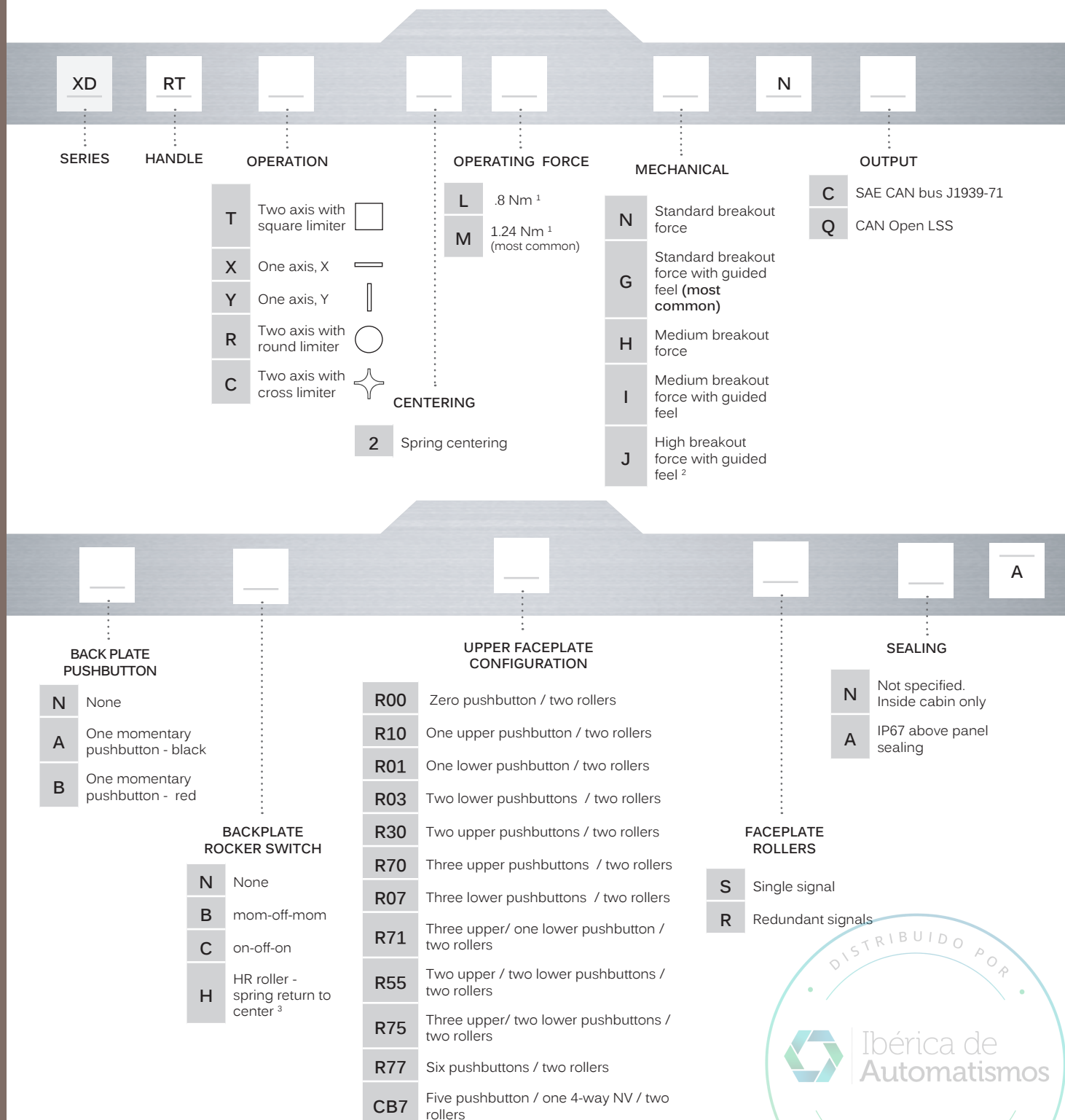


P





BUILD YOUR PART NUMBER

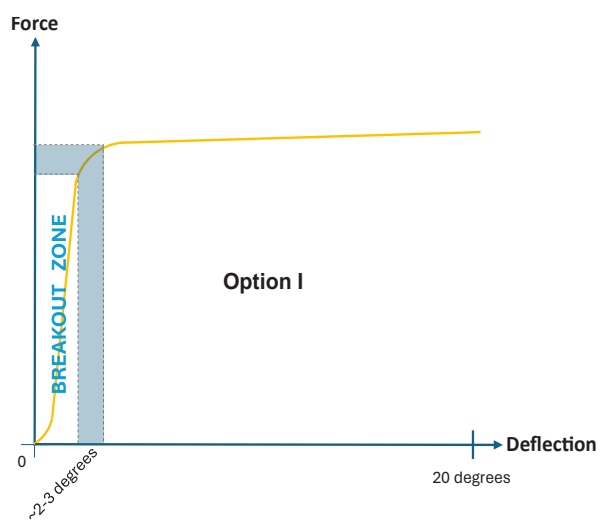
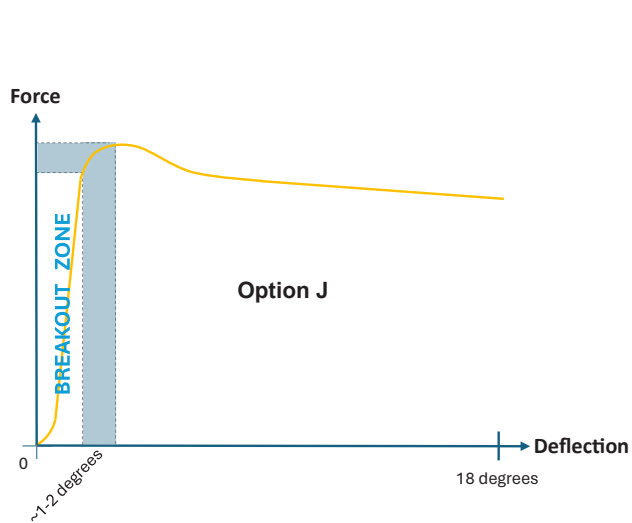
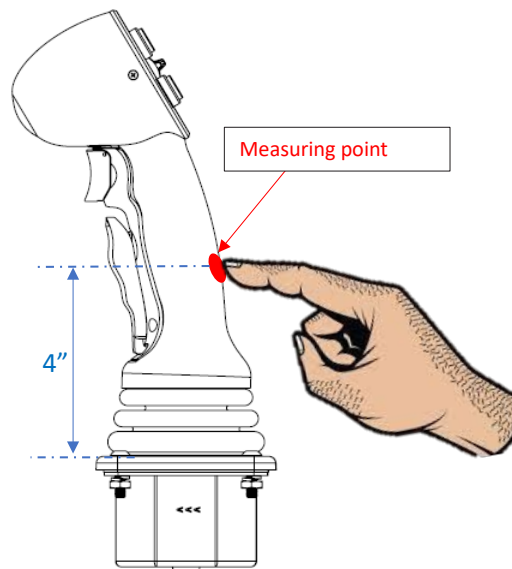
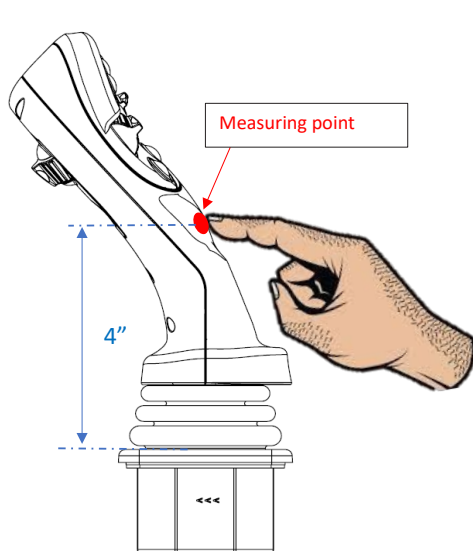


The Guided feel option aids the joystick lever into the cardinal direction
Guided feel option is recommended for «Operating force Option M»

⁴ Redundant signals cannot be selected if 1 roller on backplate and 2 rollers on faceplate.



ACTUATION FORCE



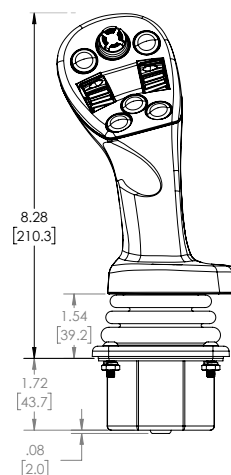
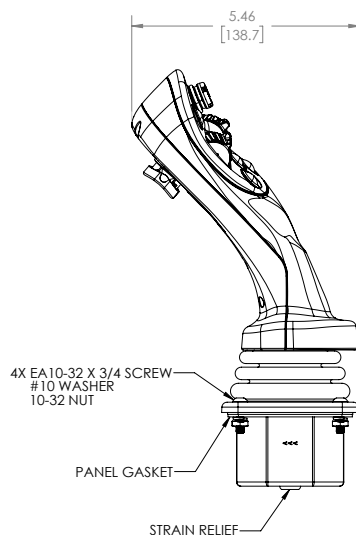
MEASUREMENT ON CARDINAL DIRECTION (in lbf)				
BREAKOUT	5% of deflection	50% of deflection	75% of deflection	100% of deflection
OPTION				
"I" (medium breakout force + guided feel)	0.8±0.3	1.2±0.2	1.3±0.2	1.32±0.15
"J" (high breakout force + guided feel)	1±0.3	1.75±0.2	1.65±0.2	1.55±0.15



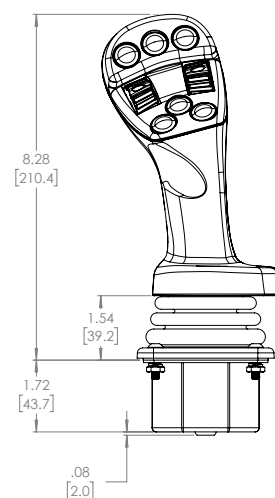
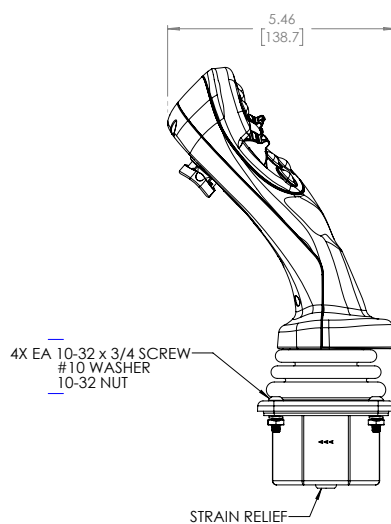
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CONTOURED FACEPLATE



RAISED FACEPLATE



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COMPONENT DESCRIPTIONS

FACEPLATE



- **IX series:** Sealed momentary pushbutton
 - Protective elastomer boot
 - IP67 panel sealed
 - Black



- **HR series:** Hall effect thumbwheel
 - One axis, proportional control
 - Single or redundant outputs
 - Optional IP67 panel sealing
 - Black



- **NV series:** 4 way navigation switch
 - Tactical momentary actuation
 - IP67 panel sealed

BACKPLATE



- **IS series:** Sealed momentary pushbutton
 - Tactile feedback
 - IP67 panel sealed
 - Black



- **HR series:** Hall effect thumbwheel
 - One axis, proportional control
 - Single output
 - Black



- **FNR series:** Three position rocker switches
 - MOM-OFF-MOM actuation
 - IP69K panel sealed
 - ON-ON-ON latch position



BACKPLATE OPTIONS



N no pushbutton
N no rocker switch



N no pushbutton
B mom-off-mom rocker switch



A black pushbutton
N no rocker switch



A black pushbutton
B mom-off-mom rocker switch



A black pushbutton
H roller spring return to center



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RAISED FACEPLATE OPTIONS



R00



R10



R01



R03



R30



R70



R07



R71



R55



R75



R77



CONTOURED FACEPLATE OPTION



CB7

